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Pellaton

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(54) **ANNUAL CALENDAR MECHANISM FOR A TIMEPIECE**

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G04B 19/24 (2006.01)

(52) **U.S. Cl.** **368/28**; 368/37

(58) **Field of Classification Search** 368/28, 368/35–38

See application file for complete search history.

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(74) *Attorney, Agent, or Firm*—Griffin & Szipl, P.C.

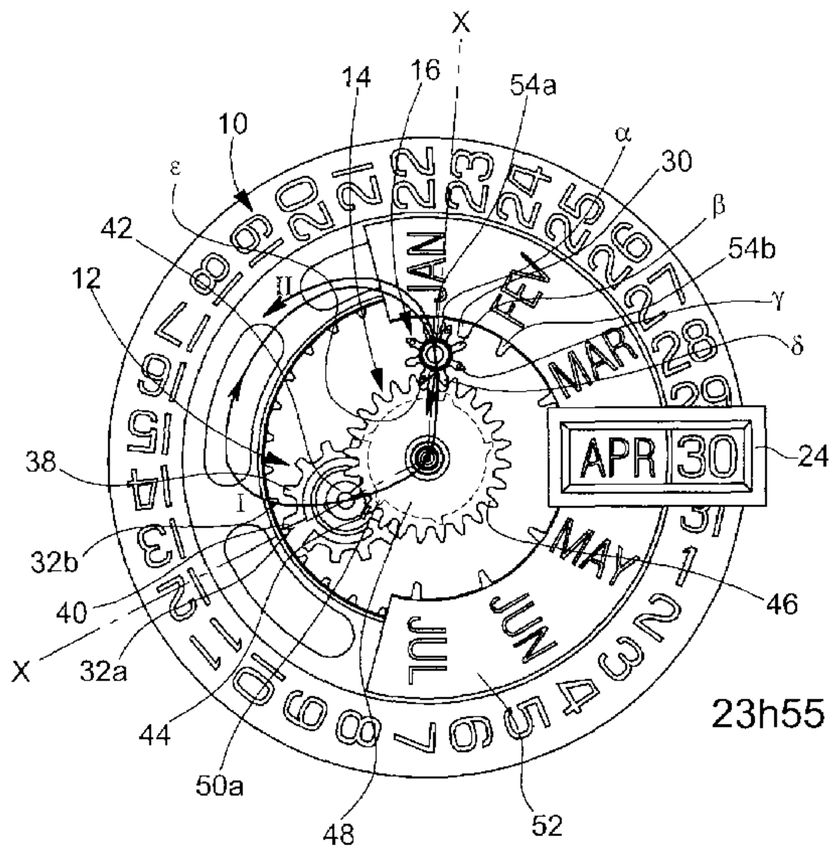
(57) **ABSTRACT**

The invention concerns an annual calendar mechanism, including:

- a date ring including a lug and 31 teeth, and a date wheel set arranged for rotating the date ring through one step per day,
- an intermediate wheel set cooperating with the lug such that the date wheel set drives the intermediate wheel set through a first step when the date passes from the 30^{th} to the 31^{st} of the month, via the date ring,
- an annual wheel set meshed with the intermediate wheel set and cooperating with the date wheel set,
- the date, intermediate and annual wheel sets being arranged such that the date wheel set drives the intermediate wheel set through a second step when the date passes from the 31^{st} to the 1^{st} of the month, for the months of 31 days, via the date ring, and such that the date wheel set drives the intermediate wheel set through a second step after the date has passed from the 30^{th} to the 31^{st} of the month, for the months of less than 31 days, via the annual wheel set, the intermediate wheel set then driving the date wheel ring.

The mechanism further includes a month indicator ring cooperating with the intermediate wheel set, the intermediate wheel set being arranged for rotating the month ring at least to the second step.

7 Claims, 8 Drawing Sheets



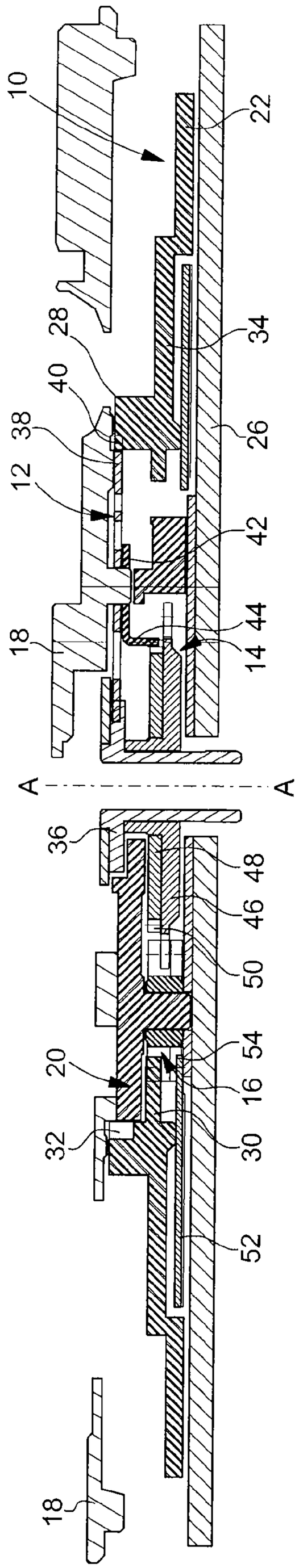


Fig. 1

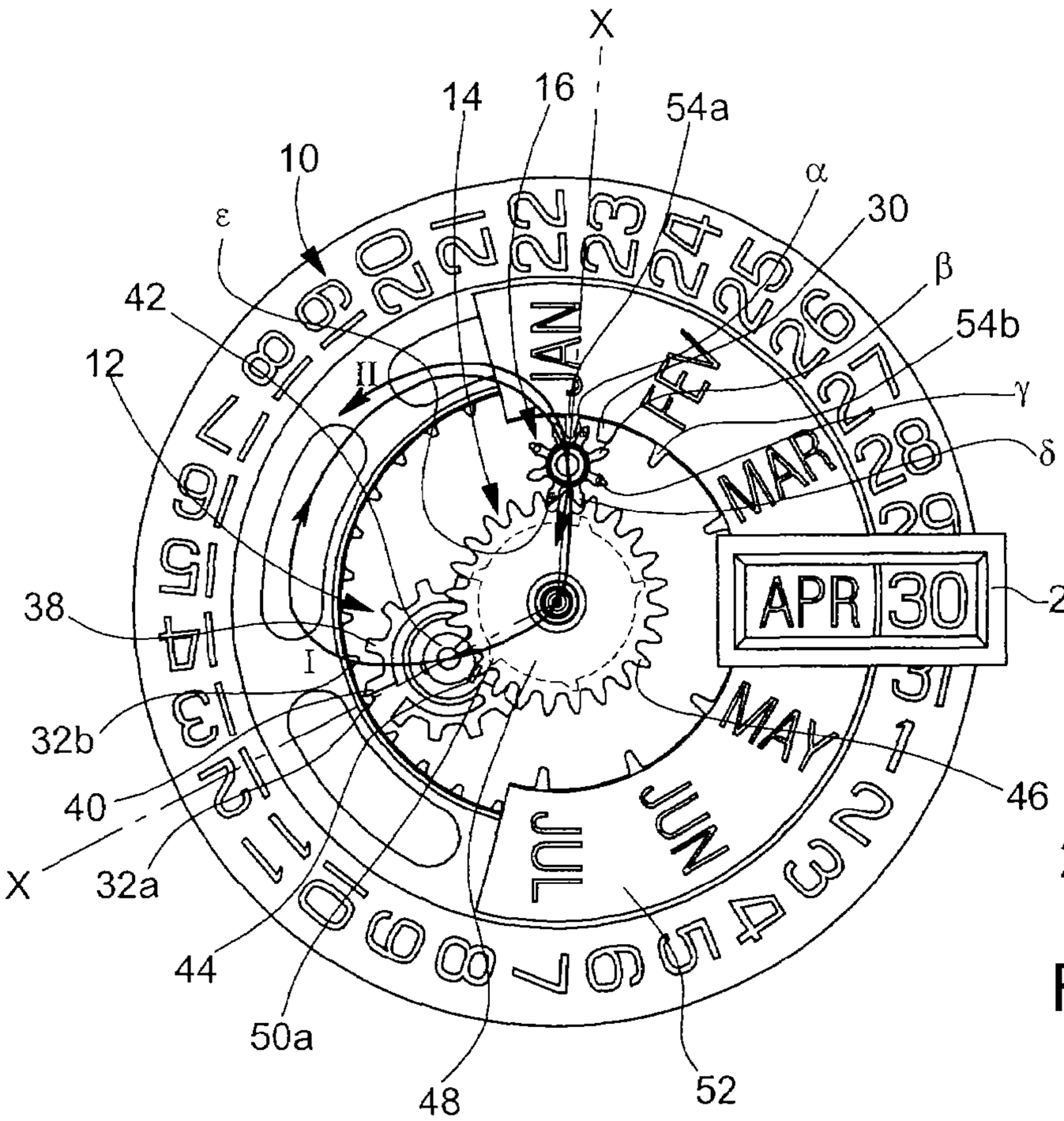
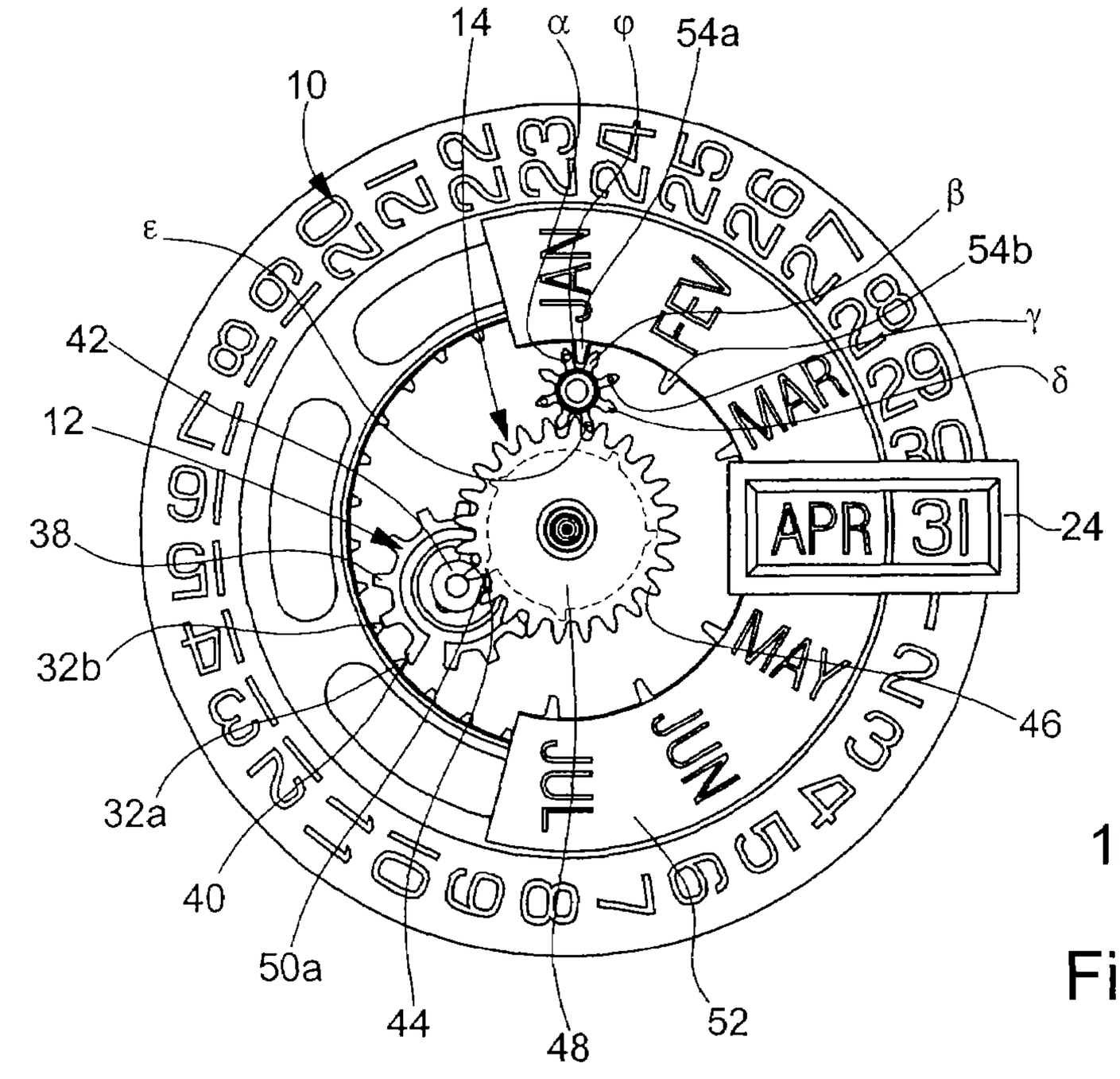

X
14
16
54a
10
α
ε
30
β
42
54b
12
II
γ
δ
38
I
24
32b
46
40
X
32a
44
50a
48
52
APR 30
23h55

Fig. 2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α
φ
54a
10
ε
β
54b
γ
42
δ
12
38
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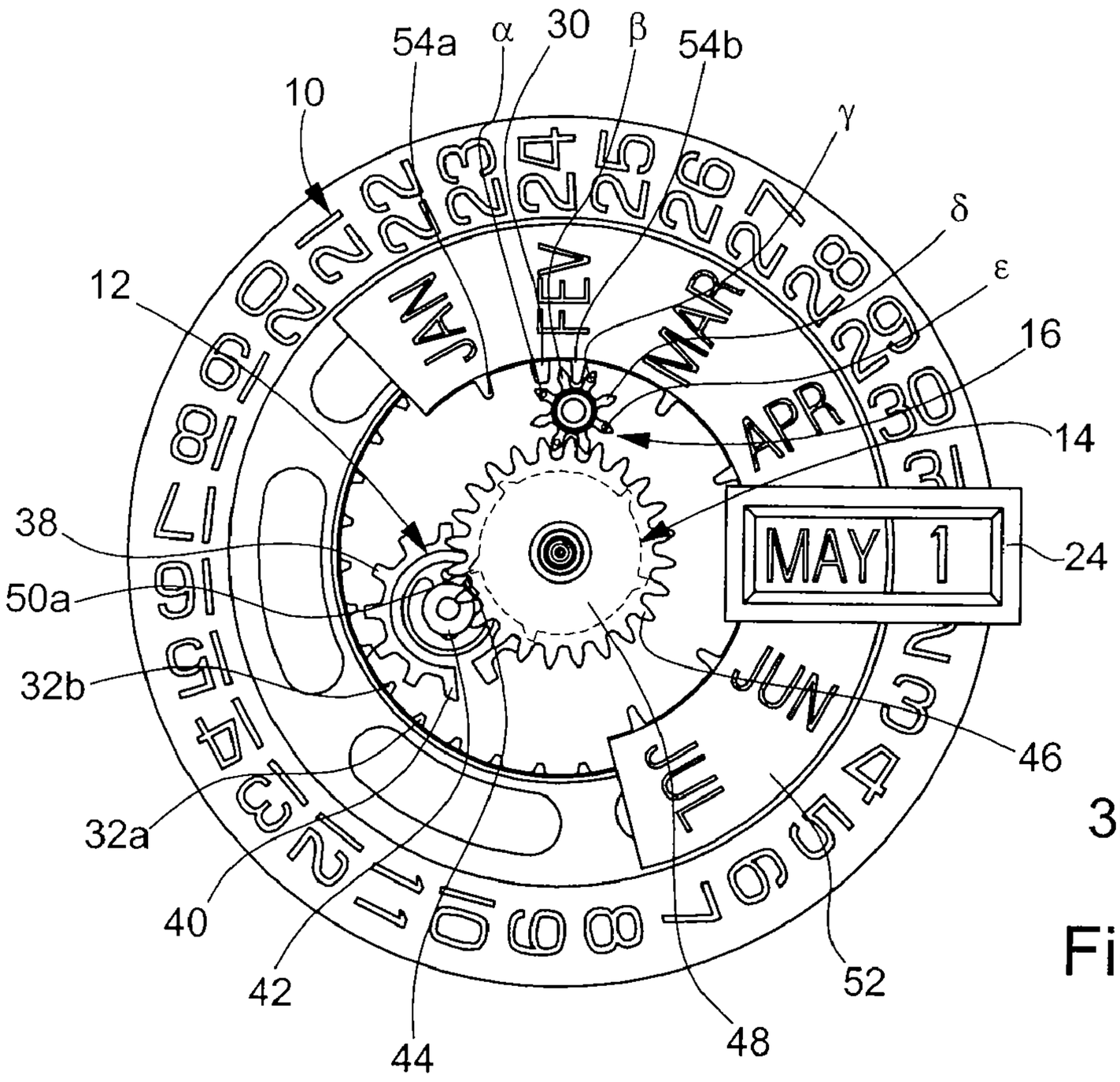
32b
46
40
32a
50a
44
48
52
APR 31
1h30

Fig. 3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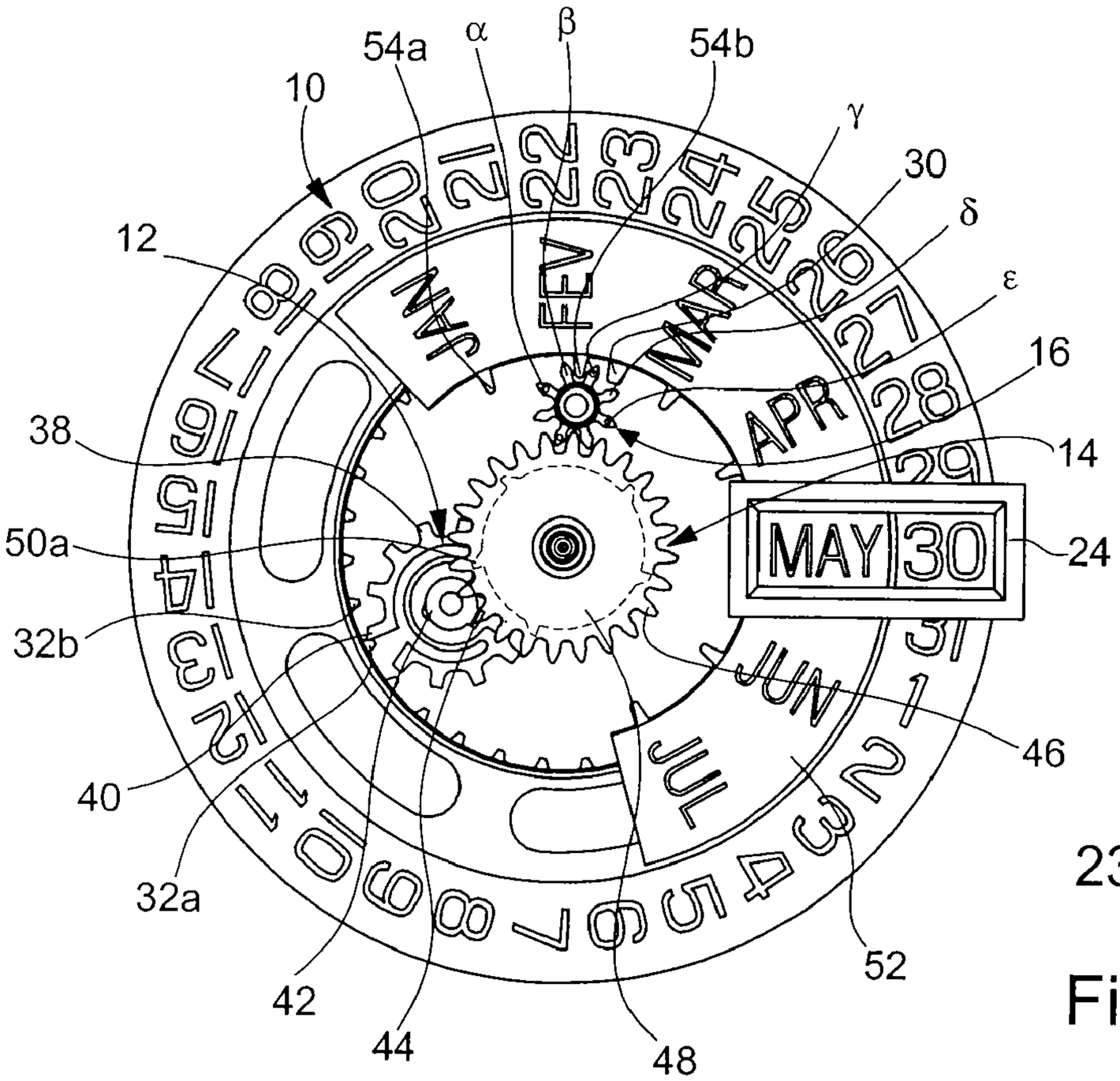
α
30
β
54b
10
γ
δ
12
ε
16
14
38
MAY 1
24
50a
32b
46
3h00
32a
40
42
44
48
52

Fig. 4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54b
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γ
30
δ
12
ε
16
14
38
MAY 30
24
50a
32b
46
23h55
40
32a
42
44
48
52

Fig. 5

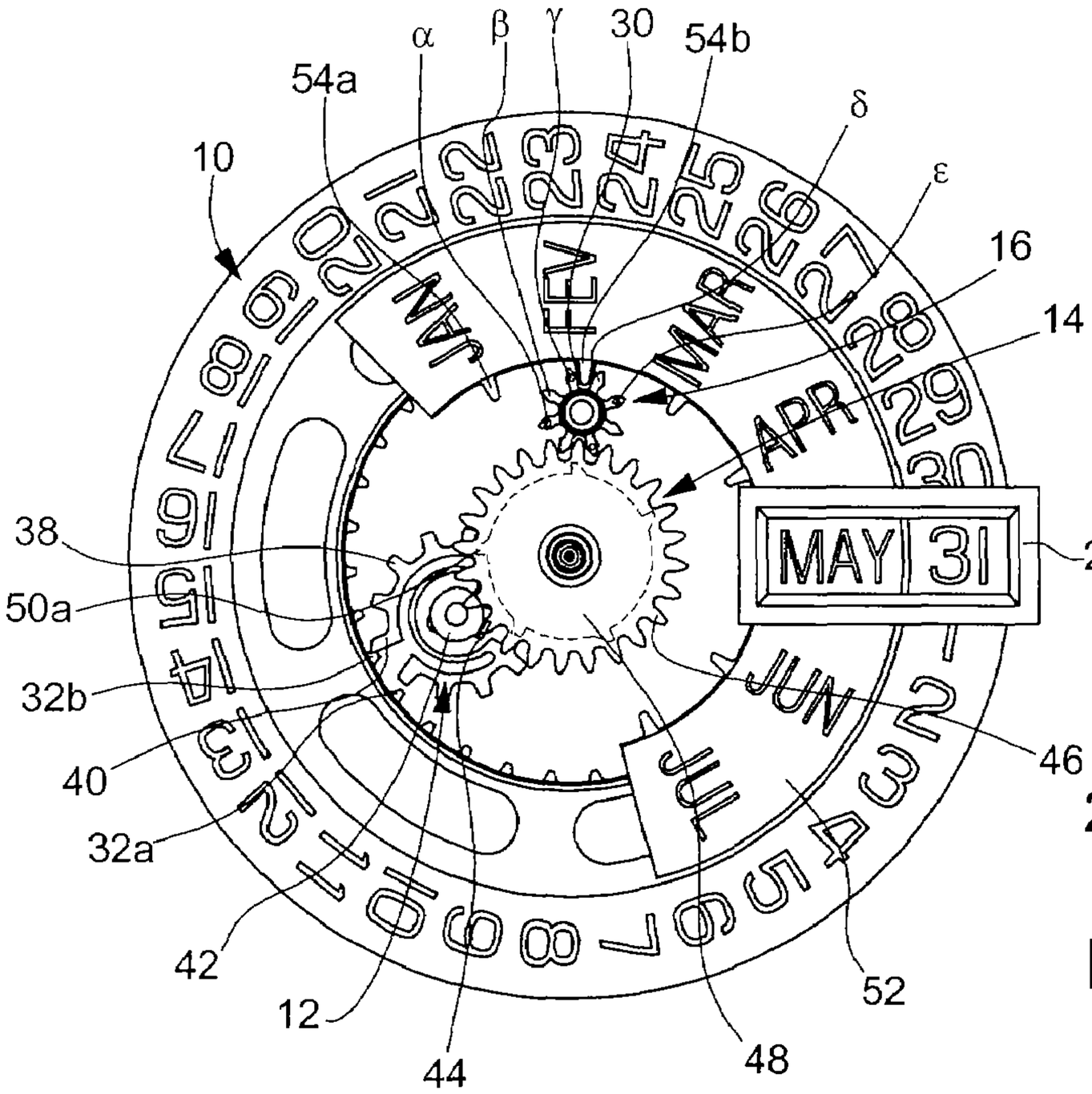

α
β
γ
30
54b
54a
δ
ε
10
16
14
38
50a
32b
40
32a
42
12
44
48
52
46
24
MAY 31
23h55

Fig. 6

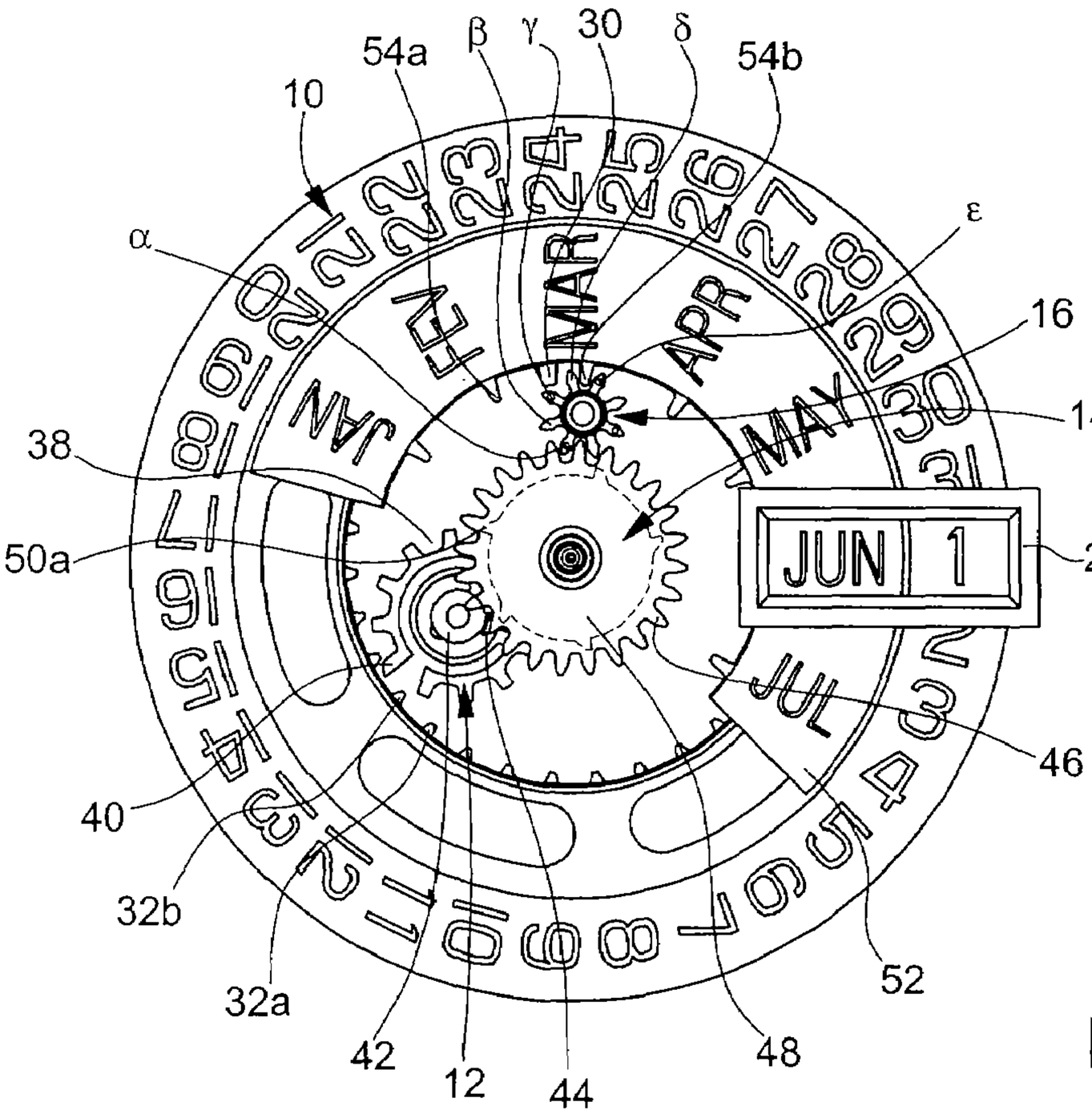

54a
β
γ
30
δ
54b
10
α
ε
16
14
38
50a
40
32b
32a
42
12
44
48
52
46
24
JUN 1
00h10

Fig. 7

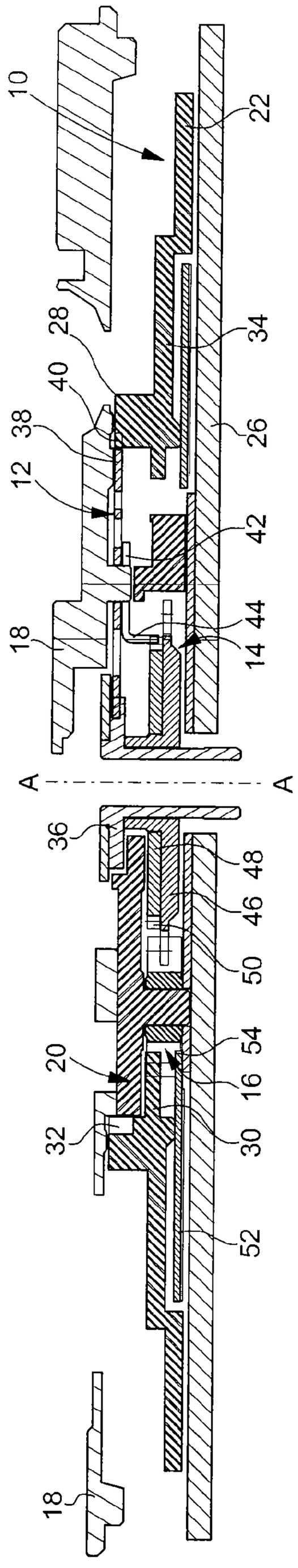
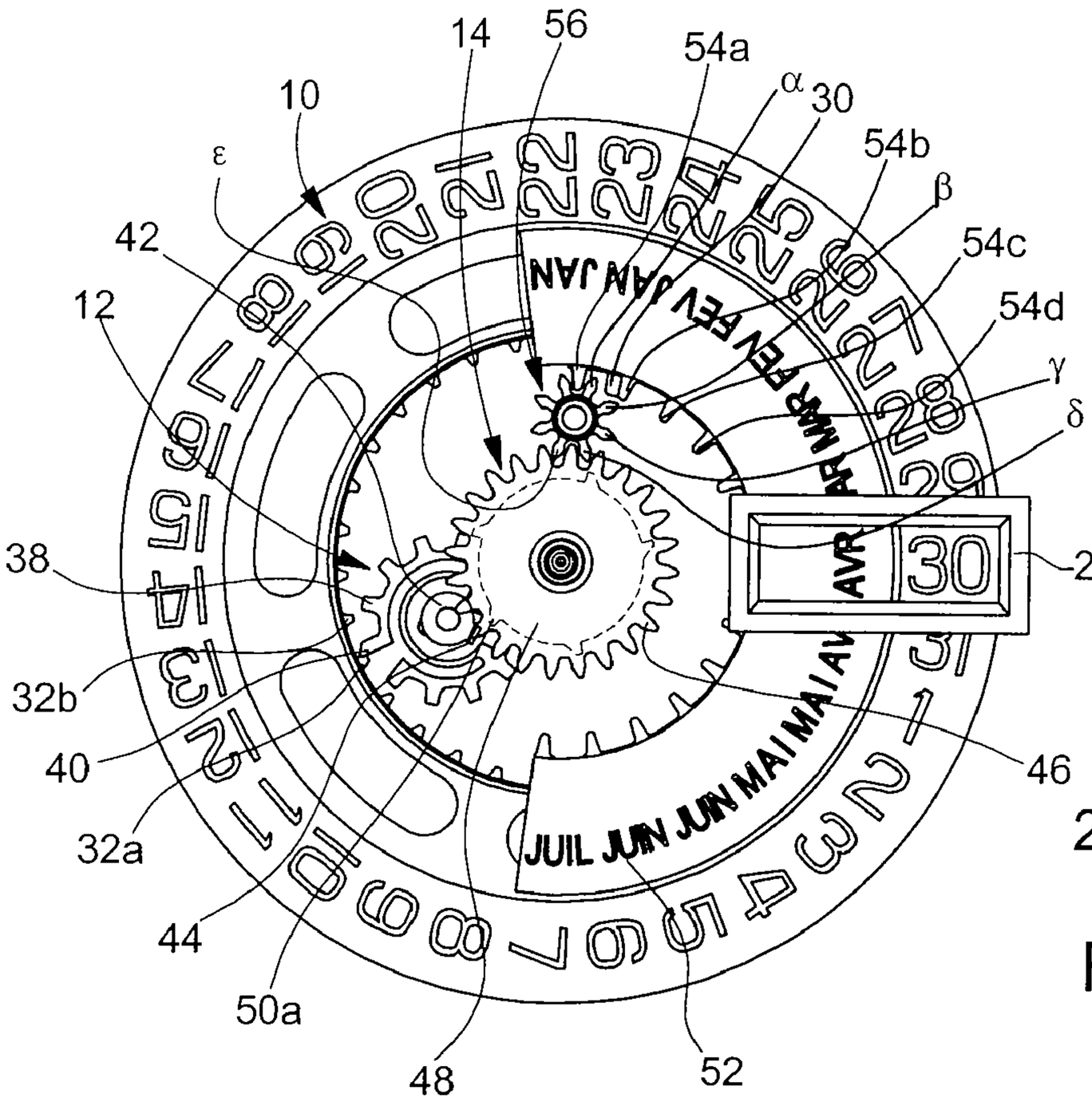


Fig. 8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56
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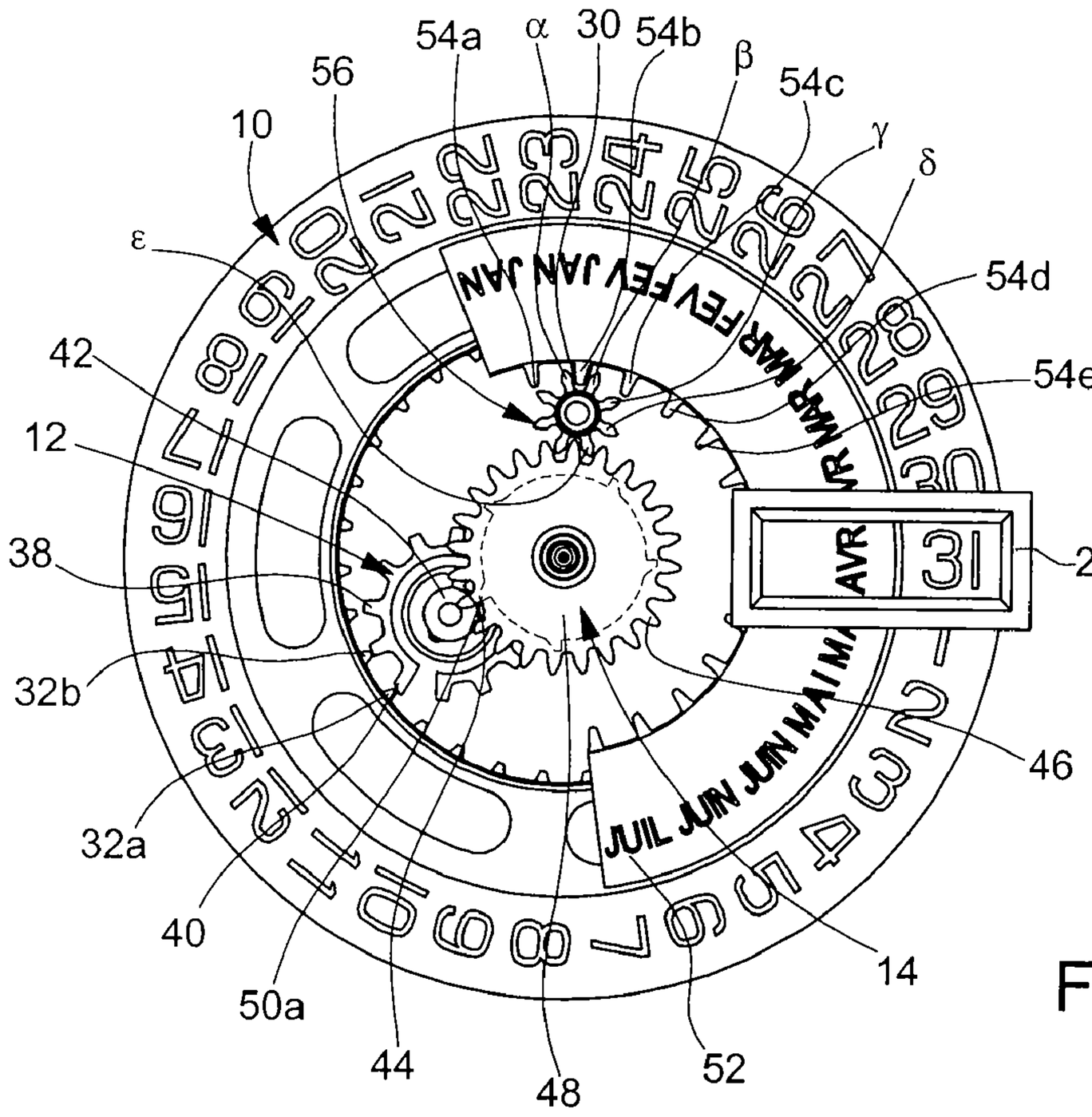
α
30
54b
β
54c
54d
γ
δ
10
ε
42
12
38
32b
40
32a
44
50a
48
52
46
24
AVR 30
23h55

Fig. 9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α
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54b
β
54c
56
γ
δ
10
ε
54d
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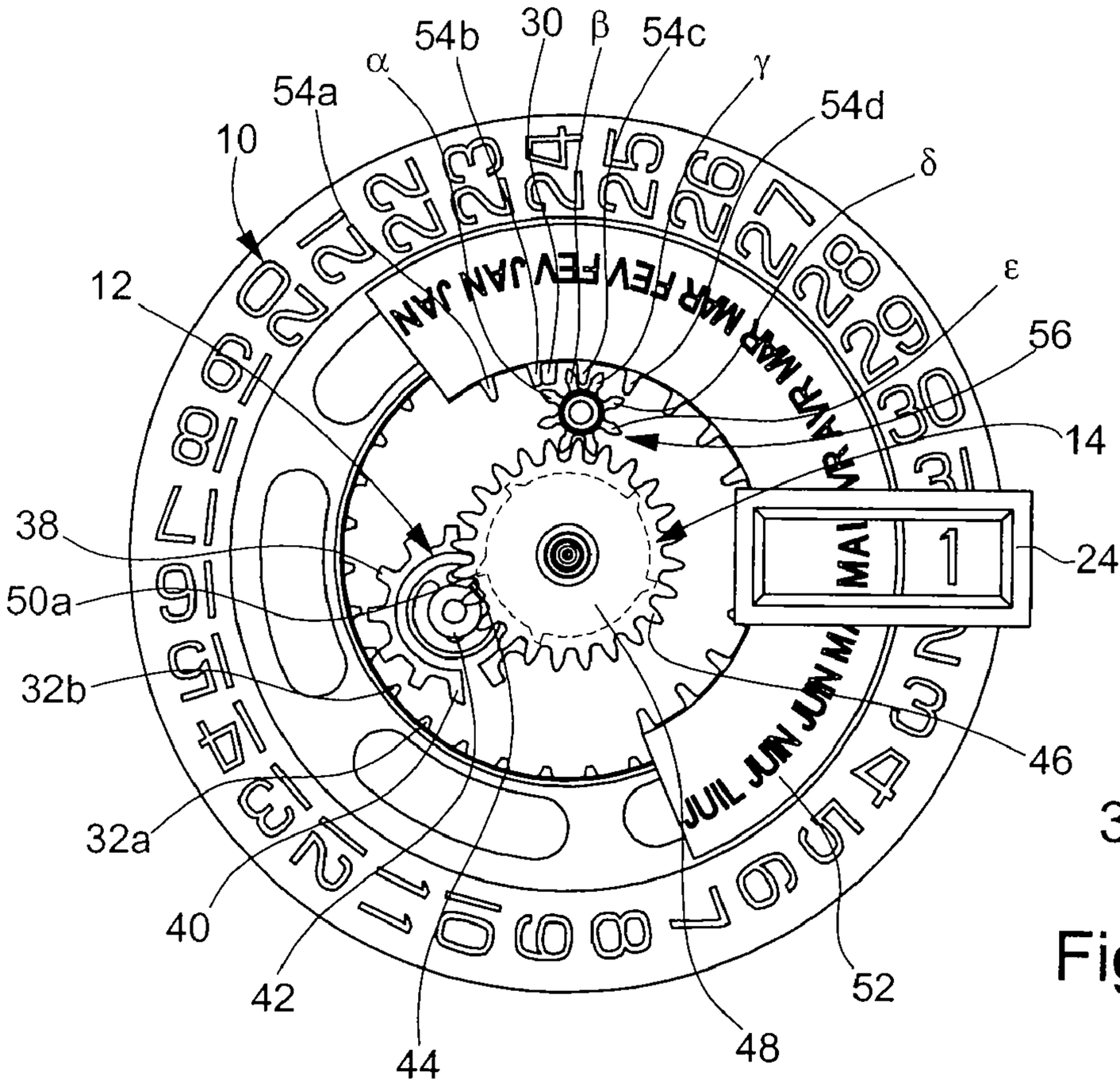
54e
12
38
32b
40
32a
50a
44
48
52
14
46
24
AVR 31
1h30

Fig. 10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β
54c
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γ
54a
54d
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δ
ε
12
56
14
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50a
32b
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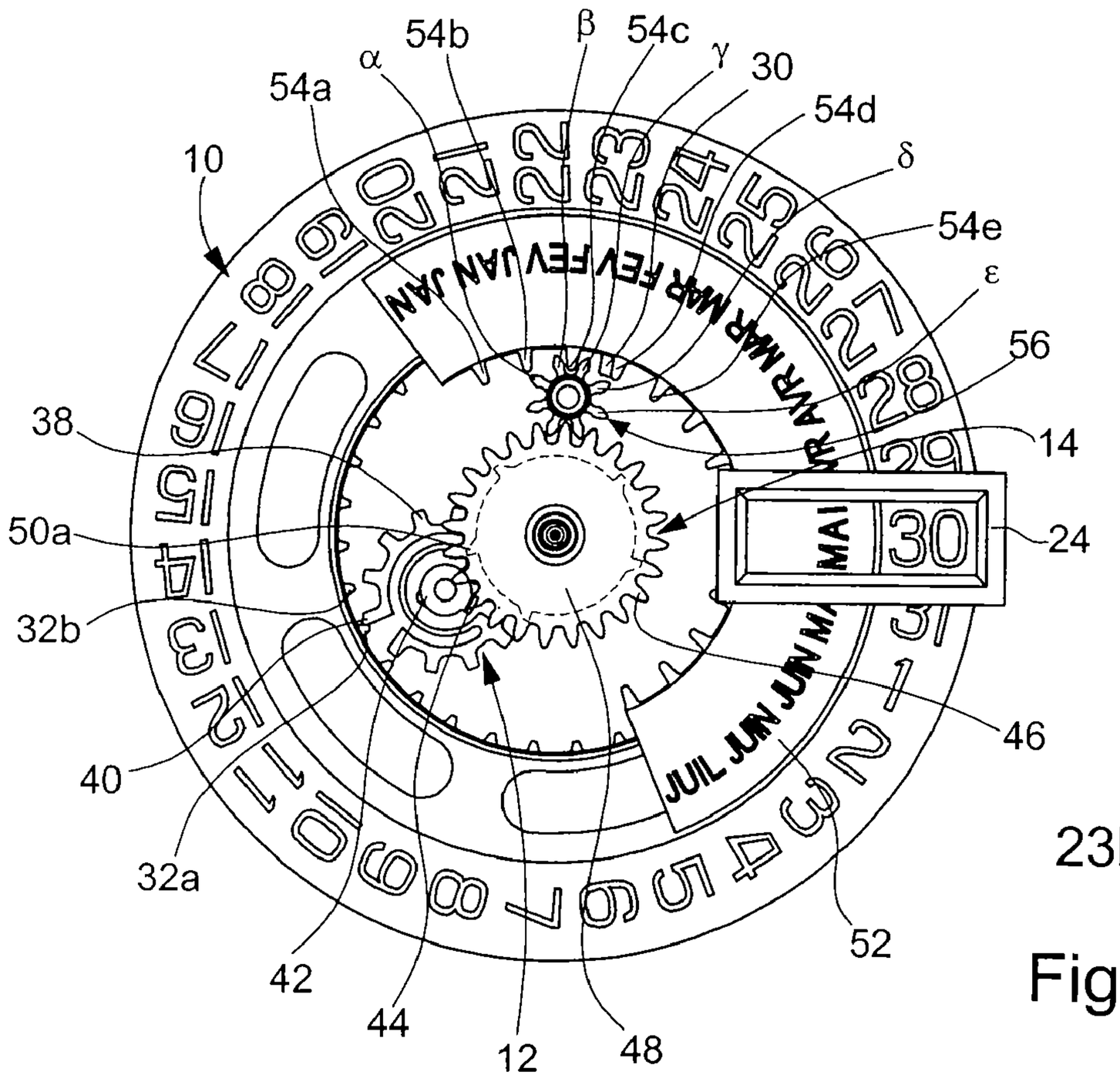
24
32a
40
42
44
48
52
MAI
1
3h00

Fig. 11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β
54c
α
γ
30
54a
54d
10
δ
54e
ε
56
38
14
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32b
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32a
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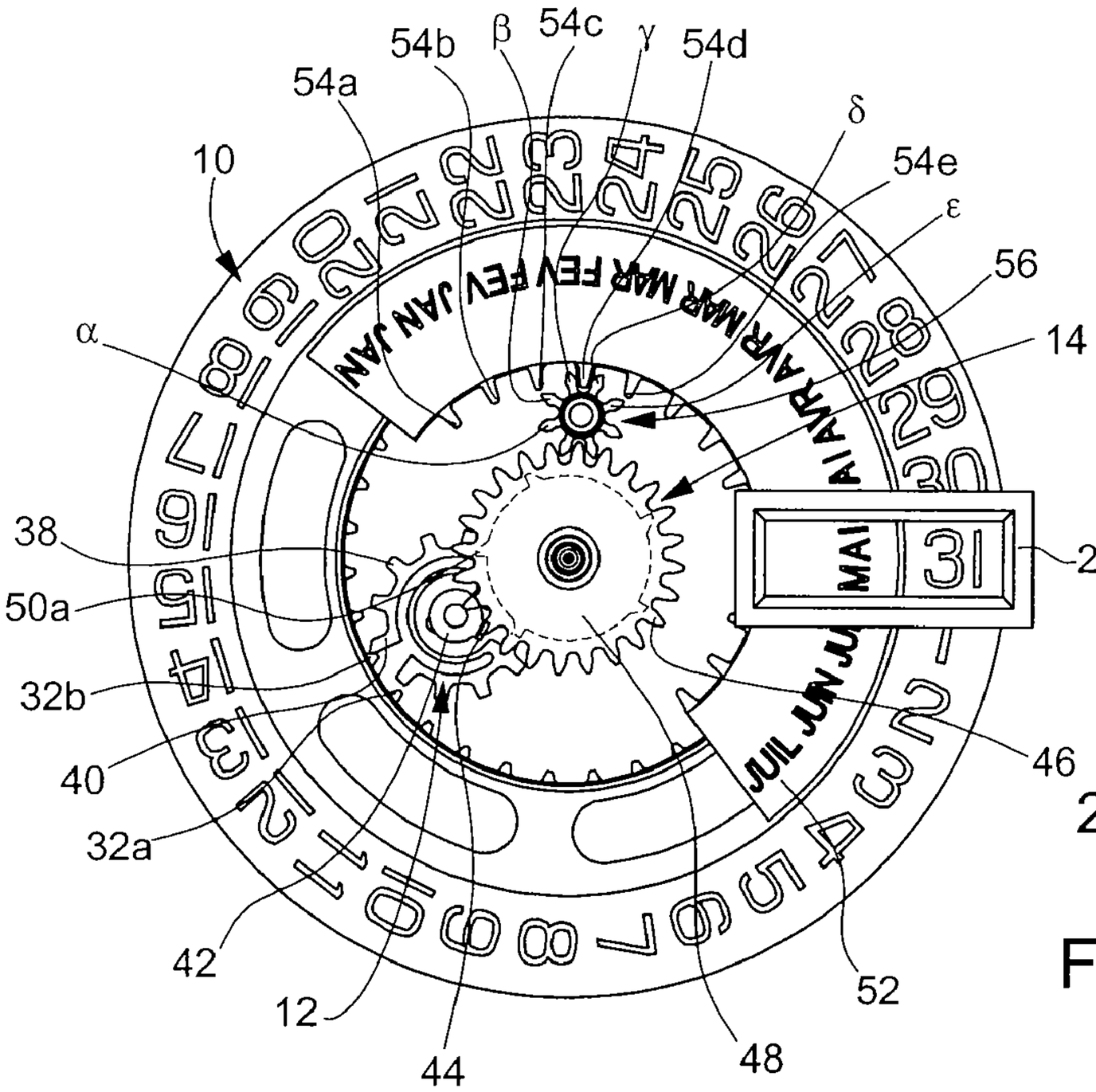
44
12
48
52
MAI
30
23h55

Fig. 12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54b
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54c
γ
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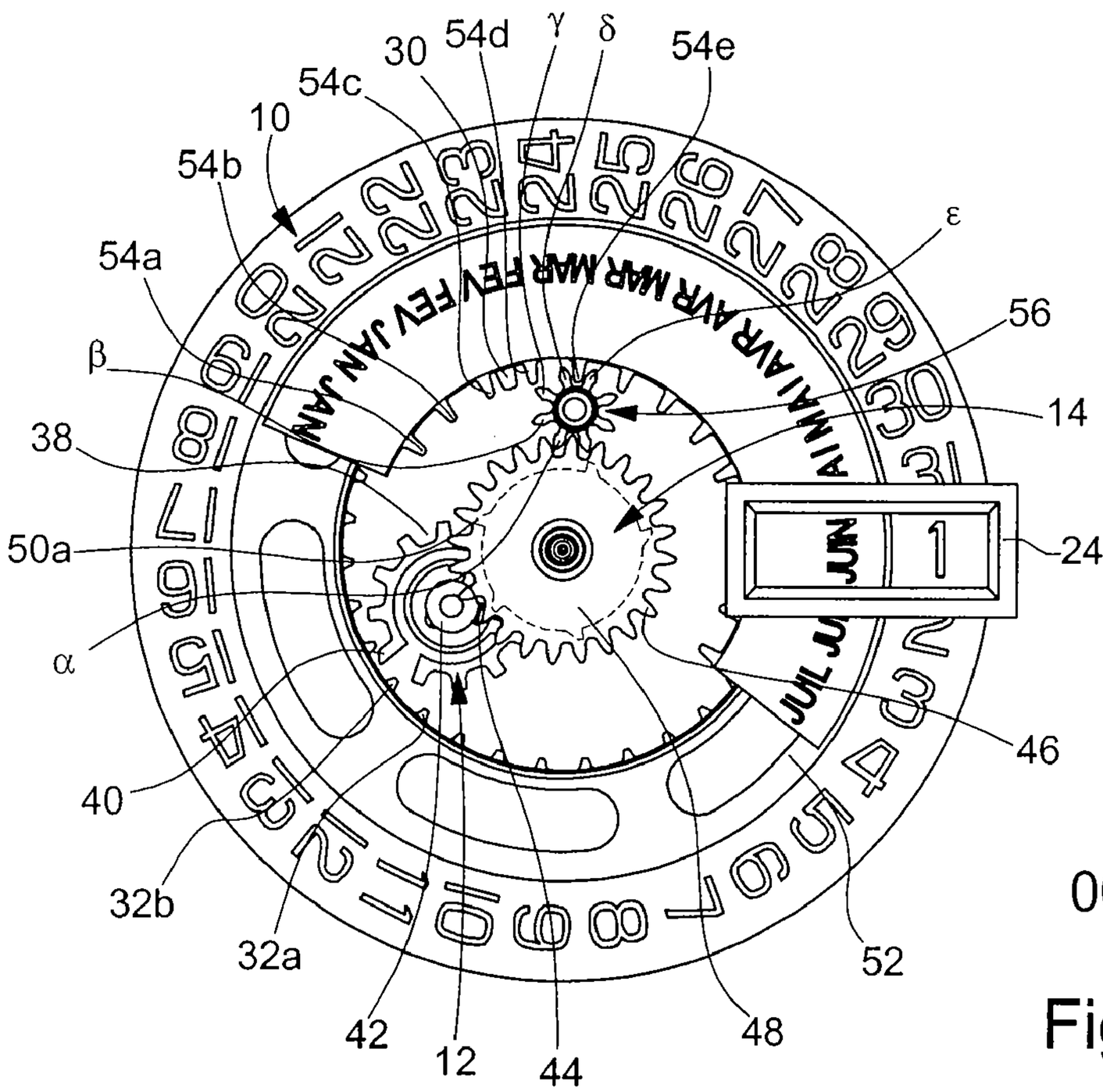
δ
54e
ε
56
14
10
α
38
50a
32b
40
32a
42
12
44
48
52
46
24
MAI
31
23h55

Fig. 13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γ
δ
54e
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54c
10
54b
54a
β
38
50a
α
40
32b
32a
42
12
44
48
52
46
24
ε
56
14
JUIN
1
00h10

Fig. 14

ANNUAL CALENDAR MECHANISM FOR A TIMEPIECE

This application claims priority from European Patent Application No. 06122850.8, filed Oct. 24, 2006, the entire disclosure of which is incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to the field of horology. It concerns more specifically, an annual calendar mechanism to be fitted to a mechanical or electromechanical watch.

BACKGROUND OF THE INVENTION

Such mechanisms are known to those skilled in the art. They enable the date to pass from the 31^{st} to the 1^{st} of the month, for months of 31 days, and from the 30^{th} to the 1^{st} of the month for months of less than 31 days. They conventionally comprise a date ring fitted with 31 teeth, actuated once per day and per step, by a date wheel set. They are also generally fitted with an additional mechanism for actuating said date ring a second time upon the passage from the 30^{th} to the 31^{st} of the month, for months of less than 31 days.

This type of calendar mechanism is disclosed in EP Patent Application No. 04028561.1. It includes an annual wheel set and an intermediate wheel set, forming with the date ring and the date wheel set two kinematic chains whose origin is the date wheel set. The annual wheel set is formed of a wheel and a plate comprising 5 lugs corresponding to the 5 months of less than 31 days. The intermediate wheel set is formed of a first wheel cooperating in a two step cycle with a lug located on the date ring, and a second wheel cooperating with the wheel of the annual wheel set. The date wheel drives the date ring once per day using a first beak that comes into contact with one of the 31 teeth thereof. When the date passes from the 30^{th} to 31^{st}, the lug located on the date ring meshes with the intermediate wheel set and drives the latter through one step. The intermediate wheel set then itself drives the annual wheel set through a first step. When the month in progress is a month of 30 days, one of the five lugs located on the plate of the annual wheel set appears on the trajectory of a second beak of the date wheel. The latter drives the annual wheel set through a second step, which itself drives the intermediate wheel set through a second step. The latter then drives the date ring through one step, via its lug. The date passes from the 31^{st} to the 1^{st} and the lug is released. When the month in progress is a month of the 31 days, no lug appears in contact with the beak of the date wheel. The date wheel completes one revolution prior to driving the date ring normally for the date to pass from the 31^{st} to the 1^{st}. The lug of the date ring drives the intermediate wheel set through a second step, which itself drives the annual wheel set through a second step. The lug is released.

SUMMARY OF THE INVENTION

The mechanism thereby described has two embodiments. In a first variant, a month indicator disc is secured to the annual wheel set. Since the latter rotates a first time when the date passes from the 30th to the 31^{st} and a second time when the date passes from the 31^{st} to the 1^{st}, each month appears twice on the month indicator disc, and occupies an angular sector of one 24^{th} of a revolution. The month display is, consequently, relative small. In a second embodiment, a month indicator disc is secured to a star wheel mounted to rotate freely on the month wheel set, and a third wheel is

fixedly mounted to the intermediate wheel set. The third wheel of the intermediate wheel set actuates the star wheel, solely during the second step of the intermediate wheel. In this embodiment, each month only appears once on the month indicator disc and occupies an angular sector of one 12th of a revolution. Consequently, the display is larger than in the preceding embodiment. However, this advantage is offset by the fact that the mechanism includes additional parts that increase the thickness thereof.

Whichever embodiment is chosen, it is desirable to reduce the thickness of this type of calendar mechanism. Indeed, the calendar mechanism occupies a place, in a watchcase, between the movement and the dial. When the thickness of the calendar mechanism is large compared to that of the movement, the winding stem and the crown are shifted off-centre vertically on the side of the case, which is unattractive and inconvenient.

The present invention limits this drawback, by proposing a calendar mechanism of the type disclosed in EP Patent Application No. 04028561.1, but of reduced thickness.

More specifically, the invention concerns an annual calendar mechanism for a timepiece including:

- a date ring including a lug and 31 teeth, and a date wheel set arranged for rotating the date ring through one step once per day,
- an intermediate wheel set cooperating with the lug such that the date wheel set drives the intermediate wheel set through a first step when the date passes from the 30^{th} to the 31^{st}, via the date ring,
- an annual wheel set meshed with the intermediate wheel set and cooperating with the date wheel set,
- the date, intermediate and annual wheel sets being arranged such that the date wheel set drives the intermediate wheel set through a second step when the date passes from the 31^{st} to the 1^{st} for months of 31 days, via the date ring, and so that the date wheel set drives the intermediate wheel set through a second step after the date has passed from the 30^{th} to 31^{st}, for months of less than 31 days, via the annual wheel set, the intermediate wheel set then driving the date ring.

According to the invention, the mechanism further includes a month indicator ring including an inner flank fitted with teeth cooperating with the intermediate wheel set, the intermediate wheel set being arranged to rotate the date ring at least through a second step.

Owing to these features, the thickness of the calendar mechanism according to the invention is reduced, to a minimum, by the thickness of the month indicator disc.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the present invention will appear more clearly from the following detailed description of an example embodiment of a calendar mechanism according to the invention, this example being given by purely by way of non-limiting illustration, with reference to the annexed drawing, in which:

FIGS. **1** and **8** are cross-sections along an axis XX of first and second embodiments of the calendar mechanism according to the invention,

FIGS. **2** to **7** and **9** to **14** are top views illustrating various operating steps of said mechanism respectively according to a first and a second embodiment.

DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENTS

The calendar mechanism shown in FIG. **1**, conventionally comprises a date ring **10** of axis AA, a date wheel set **12** for driving date ring **10**, an annual wheel set **14** coaxial to the date ring **10** and an intermediate wheel **16**, together forming two kinematic chains whose origin is the date wheel set **12**. The assembly is mounted on the top face of a plate **18**, provided with a bridge **20**.

The date ring **10** is angularly positioned by a jumper spring that is not shown, mounted on bridge **20**. It conventionally includes an annular portion bearing the date markings visible through an aperture **24** made in a dial **26**. It further includes, a substantially cylindrical portion **28** fitted with a lug **30** in a top stage, and 31 teeth **32**, corresponding to the 31 days of the month, in a bottom stage. The annular **22** and cylindrical portions **28** are rigidly connected to each by a substantially annular intermediate portion **34** forming a with annular portion **22**. The function of intermediate portion **34** will be better understood in the following description.

Date ring **10** is driven once per day through one step, by date wheel set **12**. The latter completes one revolution in **24** hours, and draws the drive force acting thereon from a kinematic chain driven by a movement belonging to a timepiece, the last link of which is formed by an hour wheel **36**. It includes a toothed wheel **38**, one of whose teeth, longer than the others, forms a beak **40** cooperating with teeth **32**. The date wheel set further includes an additional part **42** fitted with a finger **44** cooperating with the annual wheel set **14** so as to drive the latter through one step at the end of each month comprising less than 31 days.

The annual wheel set **14** is formed of an annual wheel **46** with 24 teeth, secured to a circular plate **48** comprising 5 lugs **50** corresponding to the five months of less than 31 days. The lugs **50** are angularly distributed around plate **48** so as to reflect the distribution of the months of less than 31 days in the year. The annual wheel set **14** is driven by the date wheel set **12**, using lugs **50**, when one of them is on the trajectory of finger **44**, as explained hereinafter.

Intermediate wheel **16** is meshed with annual wheel **46**. Moreover, it is arranged on the path of lug **30** so as to cooperate in two steps with the latter when the date passes from the 30^{th} to the 31^{st} and then from 31^{st} to the 1^{st}. It includes alternately thick teeth and thin teeth, the latter being identified by a dot in FIGS. **2** to **7**. It may be manufactured in metal by machining, or in plastic material, by injection moulding, in order to reduce the cost. It will be noted that as an alternative to the single-piece intermediate wheel **16**, one could use an intermediate wheel set formed of a first comprising an even number of teeth and a second wheel secured to the first wheel and comprising half as many teeth.

The calendar mechanism further includes, according to the invention, a month indicator ring **52**, on which the names of the twelve months of the year are marked, visible through aperture **24**. Each month occupies, on ring **52**, an angular sector of one 12^{th} of a revolution. Ring **52** is further fitted, on the inner flank thereof, with 12 teeth **54** directed towards the centre of symmetry thereof, for cooperating with intermediate wheel **16**. It is mounted coaxially to date ring **10**, can rotate freely, and extends above the intermediate portion **34** of date ring **10**. Moreover, the arrangement of ring **52** and intermediate wheel **16** is such that only the thick teeth can cooperate with teeth **54** of indicator ring **52**. The thin teeth pass underneath teeth **54** without driving said ring. Like date ring **10**, month indicator ring **52** is positioned angularly by a jumper spring that is not shown, mounted on bridge **20**. It will be noted, as is visible in FIG. **1**, that as month indicator ring **52** is arranged above the intermediate portion **34** of date ring **10**, substantially in the same plane as annular portion **22**, it does not create an excessive thickness with the various wheel sets. Moreover, owing to this arrangement, the star wheel and the third wheel of the intermediate wheel set present in EP Patent Application No 04028561.1 are omitted. This results in a considerable saving in thickness and complexity.

It will be noted that date wheel set **12** forms with date ring **10**, intermediate wheel **16** and annual wheel set **14** a first kinematic chain I, starting from date wheel set **12** and ending with annual wheel set **14**, via date ring **10** and intermediate wheel **16**, and a second kinematic chain II starting from date wheel set **12** and ending with date ring **10** via annual wheel set **14** and intermediate wheel **16**.

The date mechanism previously described is to be fitted to a mechanical or electromechanical watch powered by an electric energy source. The operation thereof will be described in detail with reference to FIGS. **2** to **4**, then **5** to **7**, illustrating the passage of the date from the 30^{th} to the 1^{st} respectively for a month of less than 31 days, then for a month of 31 days.

FIG. **2** illustrates the situation of the date mechanism according to the invention on 30^{th} April at 23h55. The date displayed is the 30^{th} April. Beak **40** of date wheel set **12** comes into contact with one tooth **32***a* of date ring **10** which it prepares to drive through one step. Lug **30** of date ring **10** is located in immediate proximity to intermediate wheel **16**, which it prepares to drive through one step. One tooth **54***a* of month indicator ring **52** is meshed with intermediate wheel **16**, such that the next active tooth of intermediate wheel **16**, is a thin tooth referenced α. The following teeth of the intermediate wheel **16** are referenced β, γ, δ and ϵ.

FIG. **3** illustrates the situation of the mechanism on 1^{st} May at 01h30. Via the action of date wheel set **12**, date wheel **10** has rotated one step. Lug **30** of date ring **10** has driven intermediate wheel **16** through one step, and intermediate wheel **16** has driven annual wheel set **14** through one step. A lug **50***a* is now located on the trajectory of finger **44**, such that annual wheel set **14** is ready to be driven through a second step by date wheel set **12**. Intermediate wheel **16** has not, however, driven month indicator ring **42**, since the thin tooth α has passed underneath tooth **54***a*. The date displayed is thus provisionally the 31^{st} April. Tooth **54***a* is still meshed with intermediate wheel **16**, but the first active tooth is a thick tooth referenced β. It will be noted that during this first date change phase, it is kinematic chain I that has been used.

Reference will now be made to FIG. **4**, which illustrates the situation of the mechanism on the 1^{st} May at 03h00. Finger **44** has driven annual wheel set **14** through a second step, and the latter has itself driven intermediate wheel **16** through a second step. The latter has driven date ring **10** via lug **30**, and the month indicator ring via tooth **54***a*, using thick tooth β. Lug **30** is released, and the date displayed is the 1^{st} of May. A tooth **54***b* is now meshed with intermediate wheel **16**. During this second date change phase, it is kinematic chain II that is used.

FIG. **5** illustrates the situation of the date mechanism on the 30^{th} May at 23h55. The date displayed is the 30^{th} May. Beak **40** of date wheel set **12** comes into contact with tooth **32***a* of date ring **10** which it prepares to drive through one step. Lug **30** of date ring **10** is situated in immediate proximity to intermediate wheel **16**, which it prepares to driven through one step. Tooth **54***b* of month indicator ring **52** is meshed with intermediate wheel **16**, such that the next active tooth of

intermediate wheel **16** is a thin tooth referenced γ. It will be noted that the positions of annual wheel set **14**, intermediate wheel **16** and month indicator ring **52** remain unchanged since the 1st May at 03h00.

FIG. **6** illustrates the situation of the mechanism on The 31st May at 23h55. Via the action of date wheel set **12**, date ring **10** has rotated one step. Lug **30** of date ring **10***h* has driven intermediate wheel **16** through a first step. The latter has not driven month indicator ring **42**, since the thin tooth γ has passed underneath tooth **54***b* meshed with intermediate wheel **16**. The date displayed is thus the 31st May. Tooth **54***b* is still meshed with intermediate wheel **16**, but the next active tooth is a thick tooth referenced δ. Intermediate wheel **16** has, however, driven annual wheel set **14** through a first step, but no lug **50** was on the path of finger **44**, such that date wheel set **12** completed a revolution without driving annual wheel set **14** through a second step. Beak **40** of date wheel set **12** now comes into contact with a tooth **32***b* of date ring **10**. it will be noted that during this first date change phase, it is kinematic chain I that has been used.

Reference will now be made to FIG. **7**, which illustrates the situation of the calendar mechanism on the 1st June at 0h10. Via the action of the date wheel set **12**, date ring **10** has rotated one step. Lug **30** of date ring **10** has driven intermediate wheel **16** through a second step. This latter has driven month indicator ring **42** via tooth **54***b*, using thick tooth δ. The date displayed is thus the 1st of June. One tooth **54***c* is now meshed with intermediate wheel **16**, and the next active tooth is a thin tooth referenced ϵ. Intermediate wheel **16** has, however, driven annual wheel set **14** through a second step, but lug **50** is not on the path of finger **44**. During this second date change phase, it is the same kinematic chain I that is used.

Reference will now be made to FIG. **8**, which shows a variant of the calendar mechanism according to the invention. The mechanism illustrated in FIG. **8** differs from the mechanism previously described in that it comprises an intermediate wheel **56** that has only teeth of the same thickness, and in that the month indicator ring **52** includes 24 teeth **54**, each of the twelve months being affixed twice. In this embodiment, each of the teeth of intermediate wheel **56** cooperates with the 24 teeth **54** of ring **52**, for each step taken by intermediate wheel **56**. This embodiment simplifies manufacture of intermediate wheel **56**, since alternating thick teeth and thin teeth is complex and expensive compared to a single tooth thickness.

The operation of this variant of the calendar mechanism, illustrated in FIGS. **9** to **14**, differs from the operation of the preceding mechanism, in that intermediate wheel **56** drives month indicator ring **52** at each step.

FIG. **9** illustrates the situation of this variant of the calendar mechanism according to the invention on the 30th April at 23h55. The date displayed is the 30th April, the first marking of the month of April being visible through aperture **24**. The general configuration of the mechanism is similar to the configuration illustrated in FIG. **2**, except that one tooth **54***a* of month indicator ring **52** is meshed with intermediate wheel **56**, whose teeth are all of the same thickness.

The situation of the mechanism on the 1st May at 01h30 is illustrated in FIG. **10**. The kinematic chain I has been used and the various wheels sets have rotated through one step. The situation is similar to the situation illustrated in FIG. **3**, except that the tooth a has driven month indicator ring **52** through one step. The date displayed is the 31st April, but it now the second marking of the month of April that is visible through aperture **24**. A tooth **54***b* is now meshed with intermediate wheel **56**.

Reference will now be made to FIG. **11**, which illustrates the situation of the calendar mechanism on the 1st May at 03h00. The kinematic chain II has been used and the various wheel sets have again rotated through one step. The date displayed is the 1st May, and a tooth **54***c* is now meshed with intermediate wheel **56**.

FIG. **12** illustrates the situation of the calendar mechanism on the 30th May at 23h55. The date displayed is the 30th May, the first marking of the month of May being visible through aperture **24**. The general configuration of the mechanism is similar to the configuration illustrated in FIG. **5**, except that one tooth **54***c* of month indicator ring **52** is meshed with intermediate wheel **56**. It will be noted that the positions of annual wheel set **14**, intermediate wheel **56** and month indicator ring **52** remain unchanged since the 1st of May at 03h00.

The situation of the mechanism on 31st May at 23h55 is illustrated in FIG. **13**. Kinematic chain II has been used and the various wheel sets have rotated through one step. The situation is similar to the situation illustrated in FIG. **6**, except that the tooth γ has driven month indicator ring **52** through one step. The date displayed is the 31st May, but it is now the second marking of the month of May that is visible through aperture **24**. A tooth **54***d* is now meshed with intermediate wheel **56**.

Reference will now be made to FIG. **14**, which illustrates the situation of the calendar mechanism on the 1st June at 01h10. Kinematic chain I has been used a second time and the various wheel sets have again rotated through one step. The date displayed is the 1st June and a tooth **54***e* is now meshed with intermediate wheel **56**.

Thus, an annual calendar mechanism, whose space requirement and complexity are reduced compared to the prior art has been presented.

It goes without saying that the present invention is not limited to the embodiments that have just been described and that various simple alterations and variants can be envisaged by those skilled in the art without departing from the scope of the invention defined by the annexed claims. It will be noted, in particular, that the mechanisms according to the invention are described at precise times. These times are given by way of indication and in no way limit the scope of protection.

What is claimed is:

1. An annual calendar mechanism for a timepiece, including:

a date ring including a lug and 31 teeth, and a date wheel set arranged for rotating said date ring through one step per day,

an intermediate wheel set cooperating with said lug such that said date wheel set drives the intermediate wheel set through a first step when the date passes from the 30th to the 31st of the month, via said date ring,

an annual wheel set meshed with the intermediate wheel set and cooperating with the date wheel set,

said date, intermediate and annual wheel sets being arranged such that said date wheel set drives said intermediate wheel set through a second step when the date passes from the 31st to the 1st of the month, for the months of 31 days, via said date ring, and such that said date wheel set drives said intermediate wheel set through a second step after the date has passed from the 30th to the 31st of the month, for the months of less than 31 days, via the annual wheel set, the intermediate wheel set then driving the date wheel ring,

said mechanism being wherein it further includes a month indicator ring including an inner flank fitted with teeth cooperating with said intermediate wheel set, said intermediate wheel set being arranged for rotating the month ring at least to said second step.

2. The mechanism according to claim **1**, wherein said date ring includes an annular portion bearing the markings of the

days of the month, and wherein said month indicator ring is arranged in substantially the same plane as said annular portion.

3. The mechanism according to claim **2**, wherein said date ring further includes a substantially annular intermediate portion forming a step with said annular portion and wherein said month indicator ring extends above said intermediate portion.

4. The mechanism according to claim **1**, wherein said intermediate wheel set is formed of a wheel including alternating thick teeth and thin teeth and is arranged such that only the thick teeth cooperate with the teeth of said month indicator ring.

5. The mechanism according to claim **4**, wherein said month indicator ring includes 12 teeth and wherein each month is affixed only once.

6. The mechanism according to claim **1**, wherein said intermediate wheel set is formed of a wheel whose teeth are all of the same thickness.

7. The mechanism according to claim **6**, wherein said month indictor ring includes 24 teeth and wherein each month is affixed twice.

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